Postal Regulatory Commission
Submitted 5/11/2016 3:56:36 PM
Filing ID: 95857
Accepted 5/11/2016

BEFORE THE
POSTAL REGULATORY COMMISSION
WASHINGTON, D.C. 20268–0001

PERIODIC REPORTING
(PROPOSAL ONE)

Docket No. RM2016-7

RESPONSES OF THE UNITED STATES POSTAL SERVICE TO QUESTIONS 1-3 OF CHAIRMAN'S INFORMATION REQUEST NO. 2
(May 11, 2016)

The United States Postal Service hereby provides its responses to Questions 1-3 of Chairman's Information Request No. 2, issued April 29, 2016. The questions are stated verbatim and followed by the response.

Respectfully submitted,

UNITED STATES POSTAL SERVICE

By its attorney:

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May 11, 2016

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1. Please refer to the response to question 2 of Chairman's Information Request No. 1, which states that the expected number of observations of an average letter post expansion stratum is 10.9, and 9.2 for parcel post.[1]

a. Please clarify how many parcel post expansion strata and letter post expansion strata will exist in a fiscal year.

b. Please clarify how precise and robust the regression estimators for each expansion stratum are, given the low average number of observations cited above.

RESPONSE:

First, please note that the expected number of observations of an average parcel post expansion stratum of 9.2 reported in response to Question 2 of ChIR No. 1 was incorrect. The original calculation of the number of strata for parcel post did not exclude OEO. By properly making this exclusion and reducing the number of strata for parcel post, the average number of receptacles per stratum increased from 9.2 to 46.5, which should have been the value reported in response to Question 2 of ChIR No. 1. This error was discovered in calculating the number of strata in response to this question.

a. Five variables, quarter, rate-change-period, country/country group, receptacle type, and origin exchange office (OEO), partition the letter post population into 1,533 strata. For parcel post, 244 strata are defined by four stratification variables, quarter, rate-change period, country/country group and receptacle type.

[1] Responses of the United States Postal Service to Questions 1-6 of Chairman's Information Request No. 1, April 25, 2016.

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b. Please see the Excel file provided under seal as part of USPS-RM2016-7/NP2, which includes Tables 1 and 2. Tables 1 and 2, Column I, provide the coefficient of variation (CV) from FY 2015 quarter 1 by strata for letter and parcel posts, respectively. Column J is the number of receptacles sampled for each stratum. Although strata level estimates are not precise due to small sample sizes for letter post, the estimator is model unbiased. Since the national level estimates provided to the RPW report are the sum of strata estimates, estimations errors (over- or under-estimation) tend to cancel out over the summation process across all strata. At the national-level, the regression estimator yields a small CV relative to the current expansion-based estimator, as previously reported. For parcel post, piece counts, as well as weight, are known for all strata. Because of high correlation between revenue and pieces, the regression estimator using pieces and weight as covariates explains a large proportion of variations in revenue, which is reflected by small CVs.

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2. Please provide a sample spreadsheet applying the proposed expansion and control methodology to SIRVO data as referenced in the Petition, Attachment A at 6-7.

RESPONSE:

The sample spreadsheet is provided as Table 3, filed under seal as part of USPS-RM2016-7/NP2. Table 3 provides an example of the expansion methodology of mail in the air LP mail stream destinating to Great Britain, using actual data from FY 2015 quarter 3. Each row in the table represents a different expansion stratum. The strata elements are listed in columns [B] – [G]. For each stratum, uninflated SIRVO sample data from quarter 3 are reported in columns [I] – [O]. If a stratum has no SIRVO sample data in quarter 3, it is considered an "imputed" stratum and is designated with "Yes" in column [H]. The expansion process of imputed strata is based on uninflated SIRVO sample data from proxy strata as reported in columns [P] – [R]. See the Petition, Attachment A at 8 for additional information about imputed strata.

The Global Business System-Dispatch ("GBS-Dispatch") is used by operations for dispatching outbound international mail. GBS-Dispatch captures the weight of each receptacle and, for certain mail streams, item counts based upon mail piece barcodes. Census gross weight from GBS-Dispatch is reported in column [S]. A gross-weight expansion factor is created in column [T]. It is the ratio of total dispatched weight from GBS-Dispatch divided by the sample gross weight

from SIRVO. This factor is used to tie expanded gross weight in column [U] to the level reported in GBS-Dispatch.

If a stratum is non-imputed, then the levels of expanded pieces in column [W] and expanded revenue in column [X] are determined by multiplying the gross weight factor in column [T] by the corresponding levels of sample pieces in column [I] and sample revenue in column [L]. The level of expanded net weight in column [V] is determined by multiplying the net-to-gross factor from the sample in column [O] by the amount of dispatched gross weight in column [S].

If a stratum is imputed, then the level of expanded pieces in column [W] is determined by dividing the amount of dispatched gross weight in column [S] by the average weight per piece from the proxy data in column [P]; and the level of expanded revenue in column [X] is determined by multiplying that resulting piece value by the average revenue per piece from the proxy data in column [Q]. Finally, the level of expanded net weight in column [V] is determine by multiplying the net-to-gross factor from the proxy data in column [R] by the amount of dispatched gross weight in column [S]. As shown at the bottom of the table, imputed strata account for 2.0 percent of net pounds, 0.8 percent of pieces, and 1.9 percent of revenue.

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Table 4, also submitted under seal as part of USPS –RM2016-7/NP2, provides an example of the expansion methodology of mail in the air CP mail stream destinating to Great Britain using actual data from FY 2015 quarter 3. It is arranged in a similar fashion to Table 3. Each row in the table represents a different OEO member of a stratum (hereinafter referred to as a stratum member). Strata are separated by the dashed line in the table. There are four strata in the table. Imputed strata members are defined in the same way as in Table 3. Uninflated SIRVO sample data from quarter 3 are reported in columns [I] – [O]. Proxy data are reported in columns [P] – [R]. Census gross weight from GBS-Dispatch is reported in column [S], and census pieces from GBS-Dispatch are reported in column [T]. Corresponding gross-weight and piece expansion factors are created in columns [U] – [V].

Expanded gross weight in column [Y] is tied to the GBS-Dispatch census value in column [S] using the expansion factor in column [U]. Likewise, expanded pieces in column [AA] are tied to the GBS-Dispatch census value in column [T] using the expansion factor in column [V]. For non-imputed strata members, expanded net pounds in column [Z] are based on the net-to-gross factor from the SIRVO sample in column [O]. For imputed strata members, expanded net pounds in column [Z] are based on the net-to-gross factor from the proxy data in column [R].

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To calculate the level of expanded revenue, a weighted least squares regression model is used. Within each stratum, a regression model is created which regresses SIRVO uninflated gross weight and pieces on SIRVO uninflated revenue at the receptacle level. The model produces coefficients which are reported in columns [W] – [X]. For each stratum, the piece coefficient is multiplied by the total census pieces in column [T] and the gross weight coefficient is multiplied by the total census gross weight in column [S]. The sum represents the corresponding level of expanded revenue for the stratum, so-called "GBS-Dispatch revenue." As reported in column [AB], the revenue for each stratum member is determined using an exchange office gross weight share developed from column [S] and applied to GBS-Dispatch revenue.

Final expanded revenue is reported in column [AC]. If a stratum member is non-imputed, the revenue level from the regression model in column [AB] is used. If a stratum member is imputed, final revenue is determined by multiplying the census piece value in column [T] by the average revenue per piece from the proxy data in column [Q]. As reported at the bottom of the table, imputed strata members account for 0.5 percent of revenue.

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3. Please refer to the Petition, Attachment A at 6, which states: "Under the model, the regression estimator is reduced to the ratio estimator." Please explain how the regression estimator is reducible to the ratio estimator.

RESPONSE:

Suppose $(x_1,y_1), \ldots, (x_n,y_n)$ be a sample of size *n* generated by the model defied by (Equation 1) and (Equation 2). The method of weighted least squares minimizes the function Q

$$\min_{\beta} Q = \sum_{i=1}^{n} w_i^{-1}(y_i - \beta x_i)^2$$

to obtain the estimator $\hat{\beta}$ where $w_i = \sigma^2 x_i$. By setting $\frac{d}{d\beta}\{Q\} = 0$ and solving for β, we have the model-unbiased estimator,

$$-2\sum_{i=1}^{n} \frac{x_i}{\sigma^2 x_i}(y_i - \beta x_i) = 0$$

$$\hat{\beta} = \frac{\sum_{i=1}^{n} y_i}{\sum_{i=1}^{n} x_i}$$

The total revenue $T = \sum_{i=1}^{N} y_i = \beta \sum_{i=1}^{N} x_i$ is then estimated by

$$\hat{T} = \hat{\beta} \sum_{i=1}^{N} x_i$$

which is identical to the ratio estimator.